18th ICCRTS
Degraded operational environment:
Integration of social network infrastructure concept in a traditional military C2 system.

TOPIC(s): 1: Concepts, Theory, and Policy
2: Approaches and Organizations
7: Architectures, Technologies, and Tools

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ABSTRACT

This study arose from the importance of having soldiers reliably connected to one another and to their chains of command or 'networked' despite the possibility of disruptions and/or degraded system performance. The objective was to identify possible new communications and information capabilities that ensure sufficient connectivity and performance to be able to successfully orders and share information. Satellite communications and GPS today are force multipliers, providing forces with extensive connectivity and enabling control over battlefields. These communications and information capabilities can reduce uncertainty and suppress threats but they must be implemented in ways that prevent adversaries from finding ways to deny, disrupt, and degrade them.

Lessons from recent asymmetric confrontations (i.e.NATO and Syria, Egypt, or Libya) include:

- The deployment of standard military communication systems may not be sufficient to ensure adequate connectivity and information-related capabilities;
- The adversary can destroy networks without disrupting his own vital networks or exercising a global control over public networks;
- Populations can respond to simple inputs using some social networks.

The solution posed by adversaries with these capabilities is to extend and integrate traditional C2 systems with:

- a social network infrastructure concept;
- a simplify C2 system "applet" applied to COTS devices;
- a supporting concept like crowdsourcing philosophy in a protected environment.

The resulting C2 system will be better able to operate successfully in a degraded operational environment where a simple SMS can make the difference. This paper demonstrates the value of this new approach with a simulation.

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14. ABSTRACT
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REFERENCES

- Bruzzone A.G., Cantice G., Morabito G., Mursia A., Sebastiani M., Tremori A. (2009) "CGF for NATO NEC C2 Maturity Model (N2C2M2) Evaluation", Proceedings of I/ITSEC2009, Orlando, November 30-December 4
- AG Bruzzone, Turi M., C. Frydman, G. Cantice, Massei M., Poggi S., (2009), "Development of Advanced Models for Supporting Operational CIMIC for Planners", Proc of I / ITSEC 2009, Orlando, November 30th - December 4th.
- Liddy L. (2005) "The Strategic Corporal: Some Requirements in Training and Education", Australian Army Journal, Volume II, Number 2, 139-148
- Molagh J. (2009) "How Afghanistan's Little Tragedies Are Adding Up", Time, May 26
- Moniz D. (2002) "Afghanistan's Lessons Shaping New Military", USA Today, October 7
- Patton M.S. (2003) "ES2: Every Soldier is a Sensor", The Washington Post, November 5
- Ray D.P. (2005) "Every Soldier Is a Sensor (ES2) Simulation: Virtual Simulation Using Game Technology", Military Intelligence Professional Bulletin
- Christopher S. (2011) "we could be fighting completely blind", http://www.mca-marines.org
- Gordon R. Sullivan, James M. Dubik, (1994) "war in the information age"
- USASMDC/ARSTRAD (2011) "Assured tactical access to space"
- Kurt S. Story (2010), "protecting Space" Army Space Journal

INTRODUCTION

Although many things have changed, trend for military organizations is always to continue to plan the use of the Armed Forces in a space battle, using many of the rules inherited from our recent past: the Cold War. The demonstration of this assumption is linked to the Coalitions involved in various crises, which move on the ground moving troops, vehicles and equipments that need to be guided and managed through the key function of a military force: command and control.

De facto, where this function is not sufficient or appropriate to the operational theaters, the risk is to not be able to handle and manage their own resources, driving through a operational failure.

The main lesson that Cold War has left as legacy also with the immediate and subsequent "minor clashes", is that the opposing forces must necessarily have a semblance of "sustainable conceptual equality" in order to compare two or more sides, otherwise there is not the ability to manage benchmarks, analyze power relations, production of plans or predict the opponent's moves. Parties must know the general rules of game, should appreciate a range of similar values and the forces in the field should react to a particular doctrinal context that, although different in concept, however, responds to a cultural trend, technology and a recognizable social political and economic setting.

In this sense, program, plan, establish Armed Forces and consequently the C2 systems to govern them, as well as we are mentally accustomed to think about them, makes logical sense and application; is relatively easy.

CURRENT MILITARY OPERATIONS

Presently, what is not easy to manage are the current military operations and scenarios, because they have changed a lot from the past, transforming them from open combat areas and widespread to "patchy" domains, taking place mainly in towns or close to them, where also terrorist actions are included, not only for environmental or cultural conditions. Towns, however, have always played a significant importance in military operations. From the strategic and tactical point of views, they are artificial obstacles that when they are organized militarily to defend or contrast, they acquire a high hamper power. They generally prevent to the attacking forces to achieve concentrations of power, to maneuver in tight spaces imposing to conduct extensive monitoring activities, mopping and cleaning of the territory that absorb huge amounts of time, personnel and resources in specific areas, diverting attention and commitment to other operations competing and often degrading and limiting the functions of C2.

The most interesting aspect is that the party who chooses to employ a town to defend himself, made it because he does not able to oppose a balanced antagonism for a variety of reasons technical, organizational power relations, control etc. and it is "forced" to employ techniques, unconventional tactics and unorthodox, seek

psychological objective rather than physical. Then, the town is a very strong point with which to try to impose their will on the opponent and counter his advanced or control disruptive actions, acts of terrorism, violence or even acts of guerrilla warfare that in some cases can result in a combat (i.e. Mogadishu, Sarajevo, etc.). The forces necessary to conquer a town are in fact generally much higher than those normally used in a classic military operation and are directly proportional to the size of the adversary that can make the town or what remains of it, an impregnable area even with small forces (i.e. battle of Cassino).

DOCTRINAL EVOLUTION

Doctrinal evolution leads to consider the town as a center of gravity for stabilization operation or a place where they are carried out almost exclusively military operations that also function C2 must be adapted. Another element to be taken into account in each case is that the town defender must commit many more forces to defend as the town is bigger, trying to maintain control of the town and concentrate defense in the areas of access, crossing and bypass, using the concept of the sectors and the centralization of other forces to maneuver and intervene in the center of gravity and weaknesses (i.e. Kuwait city, Baghdad, etc.).

The difference lies in the flexibility of choice that is related to the kind of confrontation and to the type of result it want to be obtained, taking into account those that are the available

forces: from a simple kamikaze attack to a planned explosion of an IED, from an isolated raid to a real ambush and up to a combined attack. So the military occupation in the classical sense in current military operations does not guarantee the operation success even if could be reached the minimum objectives of widespread presence, control, civilian safety, primary needs, etc. in a village (i.e. Iraq). If in the past open combat were considered precise and defined opposing parties, in the current military operations we have a group that is not perfectly defined that "hides and fights" in the urban areas making inadequate the techniques, tactics and procedures for operating and command and control of operations. The figure of the "irregular fighter" in the international law has almost always been regarded as an exception, but rather the current conflicts are characterized almost exclusively by these irregular forces who face regular forces and often could have a very good relationship with the local population, resulting in a particular complexity of stabilization, often characterized by phenomena of "balkanization" that can last for decades without bringing real solutions (i.e. Kosovo).

In any case must be remarked that the best technology and the most modern weapons systems are useless and oversized in asymmetric conflicts (i.e air carriers) without adequate gathering and correlation of data, supported by a valid and structured "humint", able to allow the forces gravitation and the use surgical weapon systems, useful in a full spectrum asymmetric clash. The

problem must be also highlighted in terms of tools for selecting and managing the right information since the amount of them acquired and processed thanks to decentralized forces, is so vast and multidimensional that sometimes becomes irrelevant to the impossibility to correlate the correct times and draw a common operations thread at the tactical level if you do not have the right algorithms for the correct "data mining". Asymmetric fights are usually always episodic and characterized by high level of autonomy and management of initiative at all levels; they tend to channel the opponent always in a exact areas where realize something exclusive and conclusive. In addition, the opposing actions occur after a sufficiently thorough study and targeted on a specific goal, turning a small win situation in a great psychological victory. This is also related to the different approach and value that are given to the normal values of coexistence and cultural factors that may affect the development of operational activities.

C2

In this context, C2 is strongly affected by the new operating limits for both "excess" and "defect" in which the excess capacity of the system, its speed and "information superiority" cannot be compares with the opposing, often not dictated by the needs of competition but simply by the basic need to operate, making them unnecessary to use or using badly expansive technologies and tools; or not by defects in capacity in which the

use of these tools and technologies in specific environments, climates or operating conditions makes them ineffective. This is the situation in which the complexity of counterinsurgency, as a core element of today's military and complementary missions, transforms traditional military activities (i.e. targeting where the C2, reconnaissance and intelligence activities have always had a close-up). Talking of C2 of "fighters", to be concrete is difficult to identify a battalion or a brigade of insurgents, categorized by the classical military doctrines; there are no regular units against which to deploy and contrast with own regular forces but only forces of different textures, always different and equipped, conducted and organized differently from the previous one, especially as regards the complex of forces of a certain entity, meanwhile for certain aspects the small insurgent groups can be associated with classic teams or patrols (lower units). They are usually "ghost units" that the moment before did not exist and which filling all their possible capacities, organizational and logistic gaps with a detailed knowledge of terrain and playing a sort of HUMINT (Human Intelligence) "old-fashioned", that in the context often gives the expected success.

This type of fighters could hardly give a reasonable meaning to the simplest of acronyms that we normally use to identify a C2 system, as its systems of communication can be a homing pigeon, a mobile pitched, two-way radio Motorola (sometimes with crypto module), or at most a cell phone. Their military radios (often from Soviet

origin), smart phones and computers are certainly present, but do not represent routine or standard equipment.

This strongly asymmetric confrontation exceeds all conventional stages, trying to "dislocate" the capacity of a conventional force until it becomes irrelevant, falling in the paradox of "David and Goliath".

We can therefore say that the asymmetry is quite a normal phenomena that distinguishes the various societies on the basis of culture, religion, politics and economics and not only on the basis of military capabilities and industrial resources, while the symmetry of the Cold War instead has represented a specific stage, almost an anomaly.

DECENTRALIZATION

In this scenario, C2 systems through technology, accurately reflect the situation. A classic hierarchical system of C2 is not designed to efficiently decentralize a decision-making process in a modern Support Operation, due to the strong independence of COIN environments that represent a patchy domain, identifying as a whole also the needs of civilian population of every single urban environment. Decentralization is in fact often accompanied by physical, technical and operational isolation for certain missions and therefore the isolation of chain C2. If this one can make leaders most responsible in the various levels of command and in local management and achievement of tactical missions, makes it difficult for

an effective synchronization of actions at the operational level and makes more difficult to achieve strategic and political objectives.

A C2 system oriented towards decentralization and coalition activities tends to share more information with more users and faster. Specifically, a system based on COTS HW and SW would allow a cross flow of data and information overcoming various protocols, scale and hierarchical controls, bringing the right information at the right time and maybe provide an asymmetric advantage on the adversary that can be decisive, working as he operates and decreasing his asymmetry. So, knowing that the information are transmitted and controlled by authorized users, the freedom of a horizontal communication based on the rapid exchange of messages, information and orders, become especially at the local level, a key function to get the details on the situation of the enemy time, get the right information to make contextual decisions and transform a rigid instrument such as the hierarchical chain of C2 in a more flexible and successful tool, increasing the "situational awareness" in all levels of C2.

In short, this is not only the possibility to ensure of being able to descend a step in the communication capacity putting them on the same level of the opponent but also do not recognize a "mission achievement" only as the application of pure technology but as the use of procedures of different levels and the use of a wide sharing of information. This can only be achieved

through the use of social communication systems with high diffusion inside a classical architecture of C2. The most compelling examples are offered from those situations in which one of the contenders can plan the neutralization of the opponent communication infrastructures, but especially if he is defending himself, <u>he can knock out all national communication networks certainly isolating the insurgents but also himself</u>. The real example is given to us by the recent events that occurred during the Arab Spring or the current civil war in Syria where most of the information are sent out of the country via Internet and many activities are carried out by insurgents using civilian cell phone networks employing smart phones with instant messaging, Twitter, Facebook, full-motion video podcasts, radio service software (RSS) feeds, etc.; considering that the large presence of national private network operators and proliferation of this type of devices makes to the defenders difficult to control.

APPLYING THE CONCEPT

Carrying now the concept in the military, a patrol in which each member is equipped with a portable COTS device like a smart phone, may use it to speak, producing a text message, send photos and videos to his fellow patrol, lateral and higher levels units (battalion or fusion centers for information or to government agencies and non-governmental), according to the type of information recorded or simply integrate it into his COP (Common Operational Picture) or

CTP (Consistent Tactical Picture). The individual soldier can inform different upper units simultaneously using applications via the network, interacting with surveillance and intelligence structures, giving his real-time perspective on the battlefield. Images and videos can be made available immediately to the Command Posts for the analysts who follow the actions to coordinate the support or be used for subsequent planning. In addition, certain activities may be published immediately and be used in information campaigns, PSYOPS and INFOPS or used to guide public opinion.

It should also be remembered that the majority of military personnel on active duty is "native" on mobile technologies that they uses routinely and daily and internet that is evolved into a powerful information system that ignores national borders, facilitating the decentralization of activities and able to alter the economic and social aspects of life.

In this perspective, the goal of having an advantage in an asymmetric environment where is hard to counteract insurgents, is not reached only with the best technology or the introduction of new technologies but figuring out how to best introduce the technologies already existing and already perfectly working in an optimal way to achieve the intended purposes. Last but not least, the time for the design, prototype, industrialization and distribution in the military of a ad-hoc device, able to use new technologies are too long, considering that the most important Support Operations are already active and future missions

cannot rely on long warnings time as could happen with traditional military operations.

TECHNOLOGY AND THE NEW CONCEPTS

To introduce HW and SW technologies already existing and functioning such as those introduced and used for example in mobile telephony, should be made another important observation in favor of direct use of commercial systems, given by the fact that if a country is called to serve a mission is hard to believe that a host nation, especially if officially involved (i.e. Syria), can rent part of its spectrum of communications frequencies to devote them to a foreign military Coalition communications, while the latest generation of smart phones are not affected by any constraints using multiple frequencies bands. If we compare the statistics on the use of mobile telephony equipment and technology applied, we realize that they have an increase of constant and exponential growth even in developing countries, particularly in Africa. In Afghanistan, for example, despite the economy and security are not yet stable, the telecommunications sector have had a surge in the last 5 years and up to 2012, and has been creating more than 60,000 jobs and almost one billion dollars of investment. From this point of view, a host nation, after creating a national communication network infrastructure will hardly destroy it, probably will try to control it in case of crisis and possibly even gain hiring part of such infrastructures and

systems, using it also for its military uses. The use of new software technologies will make it easy to parallelize and integrate different architectures as a <u>classic hierarchical network</u> of C2 and a <u>horizontal social network-based</u> hardware and software for daily use, using method of trading information.

MAJOR NEEDS AND POSSIBLE SOLUTIONS

Current and future operating environments will necessarily have to answer a question of centralization and decentralization on the commanders needs that should be able to select and use the best method that suits the operating situation. Clearly, there are some key factors such as: the flow of information, access to information, type of mission, size and nature of the operation areas and capacity and training of personnel that increasingly influence the achievement of the goals and the degree of centralization / decentralization of C2.

One of the primary purposes of an integrated C2 will be to ensure the flow of information to ensure the COP/CTP levels in the various orders. The requirements for this need can be identified in:

- Put the information in time;
- The sources of information must be controlled;
- Security of information;
- Absence of conflicts in information.

In this sense, the information management needs to overcome some problems that can be identified as follows:

- Capacity to bring the information quality in time;
- Knowledge, access and use of information;
- Tracking information and its origin;
- Use of common protocols for the exchange of information;
- Synchronization and scalability of information and data mining.

POSSIBLE SOLUTION: HOW TO INTEGRATE MOBILE COMMUNICATION TECHNOLOGIES AND BUSINESS NETWORKS IN TACTICS C2

To integrate mobile technology in a commercial and tactical network will need to define a conceptual model that takes into account the needs of both networks.

First, we will define a type of COTS HW smart phone that meets certain requirements with regard to safety (see crypto devices blackberry) and resistance to shock and weathering. The HW may operate on an Android operating system up-gradable on
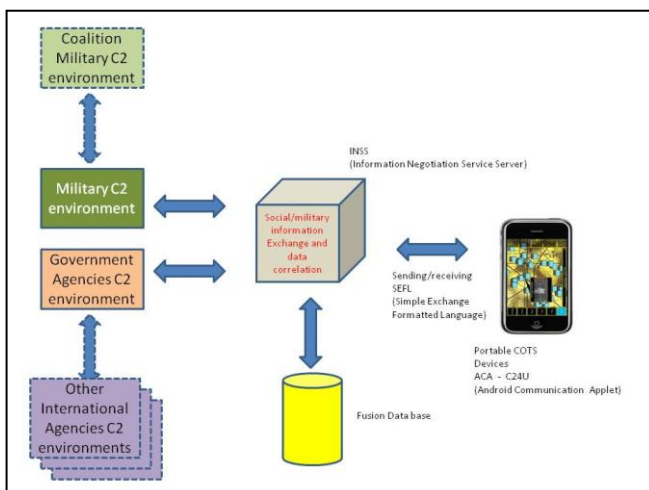
which will be developed a simplified ACA (Android Communication Applet) that will call C24U (Command Control For You).

The operator, after he having authenticated, will use the applet, quickly choose the type of communication in an intuitive GUI (Graphical User Interface) with which to send the information to the chosen recipients. If the type of communication is represented by videos and photos will be sent immediately and if it responds to a text, he can use a simple text message or, in more complex cases a more advanced system that will call SEFL (Simple Exchange Formatted Language) based on specific formatting information. The standardization of certain semantic elements will allow a more rapid recognition by a server INSS (Information Negotiation Service Server) which will be responsible for receiving the information, evaluate, correlate and integrate them into a Data Base of fusion with other information.

The integration of information in the COP/CTP could be controlled in its fairness by analysts. The concept of SEFL may be integrated with the T9 technology to speed up the compilation of messages formatted.

The primary exchange its intended between tactical military and commercial networks to facilitate the flow of information and ensure a communication simple system in the environments where the C2 can be degraded by a number of factors. Mediation System INSS, could exchange data and other information between C2 others environments such as Governments Agencies networks, authorities and Emergency facilities and even qualified civilians (with

different levels of access to information).

SIMULATION

The continuous development of technology has brought communication to increasingly complex architectures. The design, testing and management of these architectures must be supported by appropriate tools and specially designed. In this paper we propose the use of appropriate simulation tools to evaluate the overall end-to-end architecture application for the construction of the new C2 functionality as described. Another important consideration concerns the complexity of the proposed architecture in which different skills and heterogeneous must be made to work together. In this case the approach to be followed in the use of simulation is that of the distributed simulation where there is not used a single monolithic simulator, but different simulators for each architectural component. Such simulators cooperating then in a distributed simulation environment appropriately configured. The distributed simulation enables the exchange of information between different simulators that operate in heterogeneous environments. In order to make this exchange of information flexible, it is essential that the simulation environments are connected to each other (via LAN or WAN) and are equipped with a common interface. Especially in defense applications (but not only) there are two protocols that are used

to achieve interoperability of Simulations: DIS and HLA. No single monolithic simulation can in fact meet the needs of all users, and also all possible uses of the simulations and the manner of combining them together cannot be predicted in advance. Technological future capability and a variety of possible operating configurations must be considered in a distributed approach (DIS or HLA) that will allow to have:
- Federations of simulators based on modular components with well defined interfaces and functionality;
- Specific Simulations functionalities separated from a more general context.

Selex ES, through Finmeccanica Simulation Network (SimLabs), has put its own internal expertise on heterogeneous distributed simulation, in a stable and accessible "on demand" network. SimLabs is a HLA/DIS federation (currently working in unclassified mode but will became also classified in short), that allows different Finmeccanica Simulation Laboratories (including also Selex ES) to work together.

SimLabs network is also open to Government and Defense, as well as to Universities and research centers. Currently is already active in a stable connection with the NATO M&S CoE in Rome.

SimLabs with its characteristics of heterogeneity and variety of simulated domains will be able to provide the required support to the evaluation of this proposal about C2 degraded.

CONCLUSIONS

Technology is not a universal remedy but, especially in a COIN environment, can became an enabler for the commander's decision making process and a huge help to decentralize the C2 and gather the most information as possible on the adversary. Technology would always enhance capabilities of forces on the ground and make simple apply special TTP, especially in the urban environments.

Using COTS devices already available will reduce the huge cost of development of new tools, implementing current technologies and make simple to the commanders choose the best C2 method to implement on a specific operational situation, make decisions quicker and execute them in distances in less time, maintaining control and cohesion among more dispersed units.

To have success in a COIN environment will be also necessary to dare few technological challenges to innovate, learn and to adapt the equipment to the close operational environment not only having the motivation to win.

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(International Command & Control Research and Technology Symposium)

Institute for Defense Analyses

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AGENDA:
- CURRENT MILITARY OPS
- PARAMETERS
- C2
- DECENTRALIZATION
- REQUIREMENTS
- POSSIBLE SOLUTION
- SECURITY
- SIMULATION (SIM LABS)
- CONCLUSIONS

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military organizations are usually to plan the use of Armed Forces in a space battle, using rules inherited from our recent past: the Cold War.
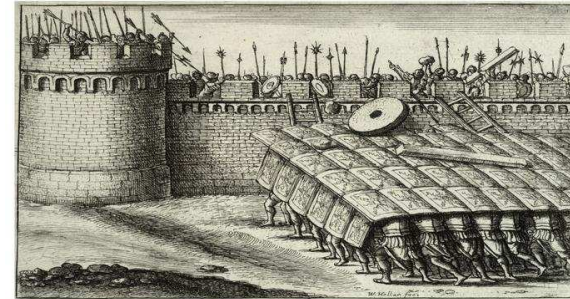
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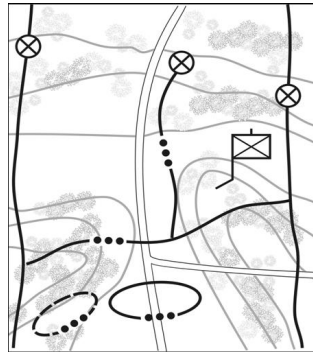
terrorist actions are not only for environmental or cultural conditions.

Doctrinal evolution leads to consider towns as center of gravity for stabilization operation and where develop military operations.
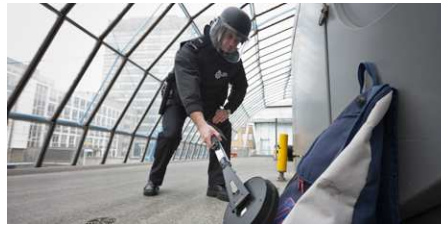
Urban terrain
- Artificial obstacles
- contrast
- achieve concentration of power
- maneuver in tight space
- monitoring activities
- Mapping territory
- absorb huge time, resources
- diverting attention from other ops
- **degrading C2 capabilities**

"humint" will allow forces gravitation and the use surgical weapon systems
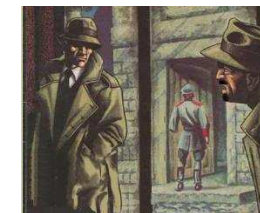
conceptual need for soldiers to identify a way to be connected to his C2 network

considering the possibility that network services could be unavailable, unreliable or having degraded performance

identify possible new communications and information capabilities to allow a sufficient orders/data transmission.
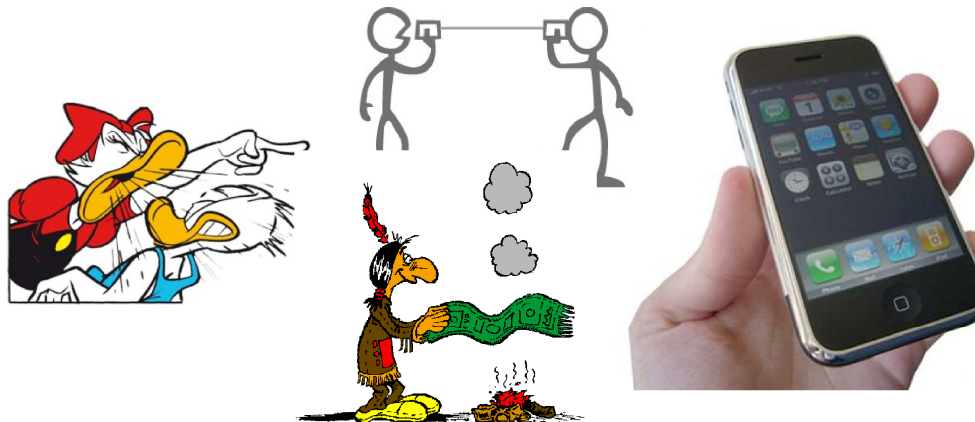
C2 system makes sense when we consider a standard military forces confrontation, with strategic denies of cyber space to the adversary.
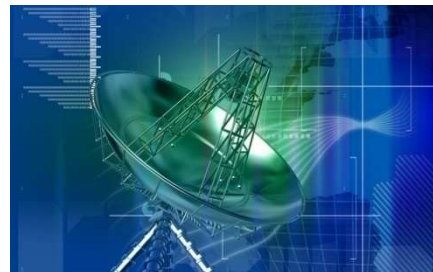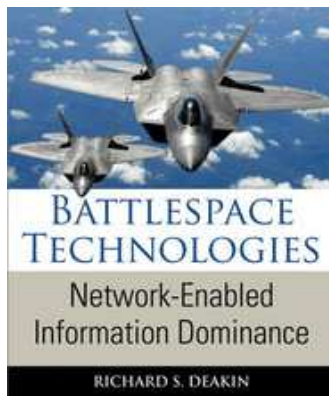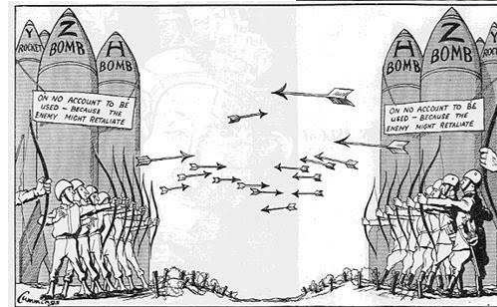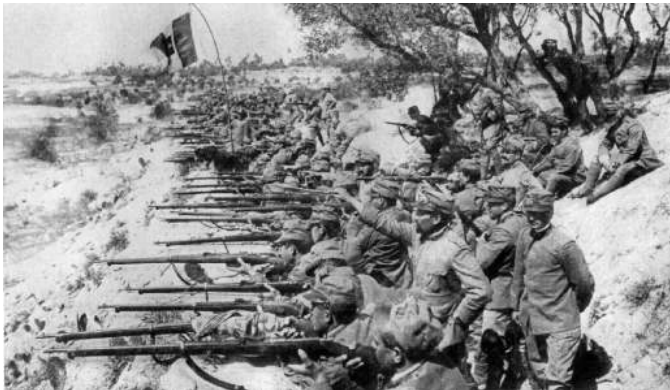
adoption of innovative information technologies that would enable information dominance.

Satellite communications and GPS today are force multipliers, providing wide coverage and enabling control over battlefields, supporting most of warfighting functions.

These capabilities can reduce uncertainty and suppress threats but they must be integrated in such a way as the adversaries find new ways to deny, disrupt, and degrade resources, satellite-based intelligence functions;
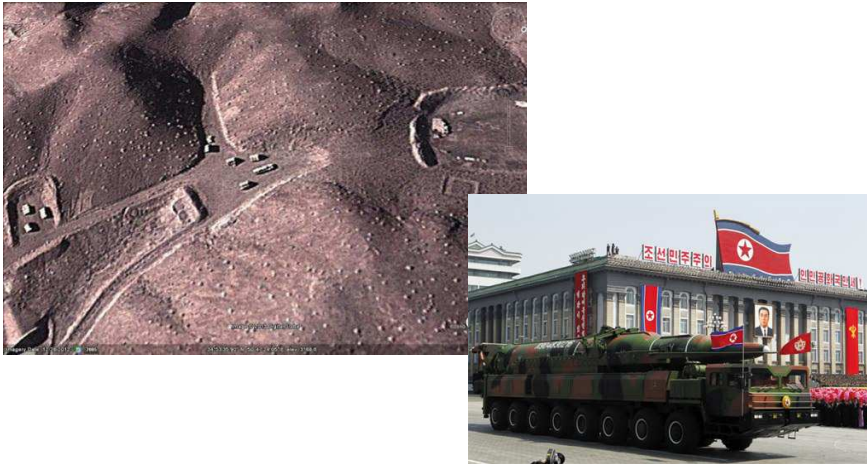
over reliance on SatCom should be considered a critical vulnerability, independently from the C2 in use.

The strongly asymmetric C2 confrontation exceeds all conventional stages, trying to "dislocate" the capacity of a conventional force until it becomes irrelevant, falling in the paradox of "David and Goliath".

A classic hierarchical system of C2 is not designed to efficiently decentralize a decision-making process in a modern Support Ope

Decentralization means physical, technical and operational isolation for certain missions and also isolation of chain C2.

CENTRALIZED (A) DECENTRALIZED (B) DISTRIBUTED (C)
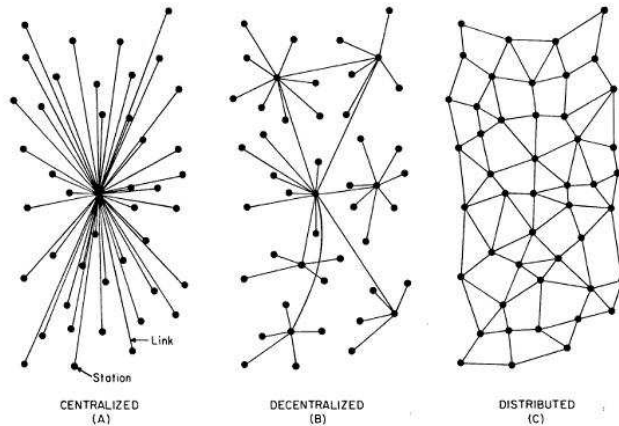
Decentralization: all leaders are most responsible; achieve local management and tactical missions.
Difficult in synchronization of actions at the operational level and difficult to achieve strategic targets.

C2 system oriented to decentralization and coalition activities tends to share faster more information with more users.

Last crisis teach what happen in a confrontation of two o more parties in a complete asymmetric environment

(i.e. Syria, Egypt, Libya crisis)

Vs

Emphasis of asymmetric environment

Enemy can destroy networks but cannot disrupt his own vital networks or exercise a global control over public networks.

In Afghanistan telecommunications sector have created in the last 5 years more than 60,000 jobs and one billion dollars of investment.

The deployment of standard military communication systems cannot be sufficient.

Anne Helmond, May 2009
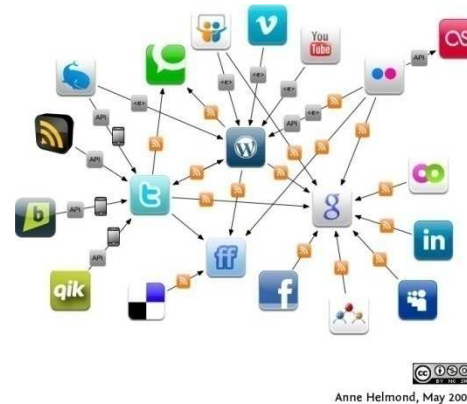
Mass of people can react to simple inputs using some networks "social".
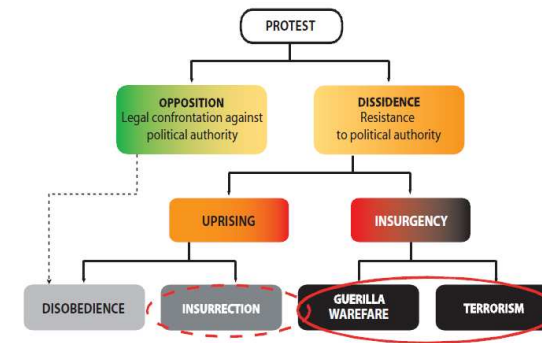
Figure 0-2. Forms of protest

latest generation of smart phones can use multiple frequencies bands.

New technologies will make it easy to parallelize and integrate different architectures as C2 network and a social network-based.

Next operating environments will answer to a centralization and decentralization of commanders needs that should be able to use the best method that suits the operating situation

information flow, info access, type of mission, size and nature of the operation areas, capacity and training of personnel influence the achievement of mission and the degree of de/centralization of C2

The requirements for these needs can be identified in:

- Put the information in time;
- The sources of information must be controlled;
- Security of information;
- Absence of conflicts in information.
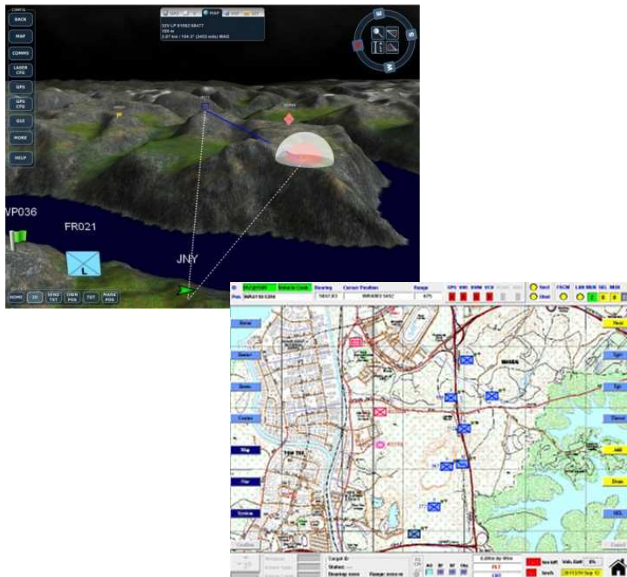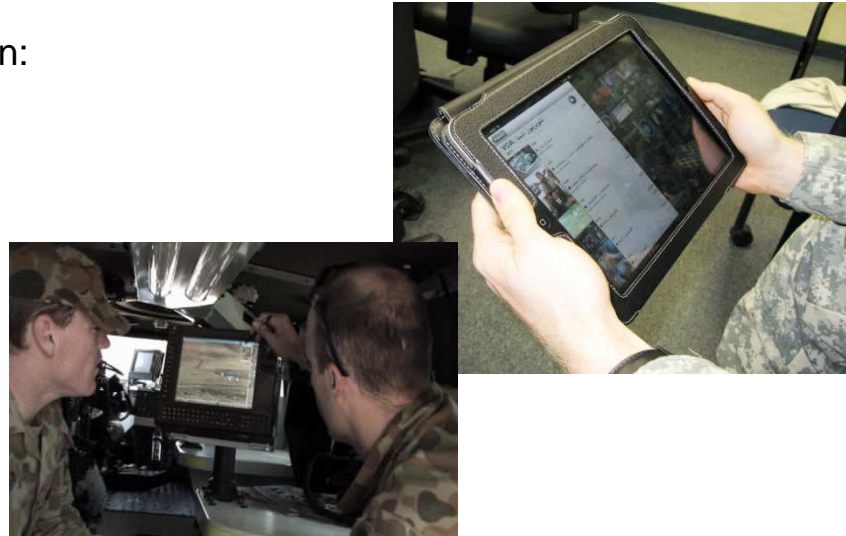
information management will assure:
- Capacity to bring the information quality in time;
- Knowledge, access and use of information;
- Tracking information and its origin;
- Use of common protocols for the exchange of information;
- Synchronization and scalability of information and data mining.

The answer can come from the integration of a traditional C2 system with:

- a social network infrastructure concept;
- a simplify C2 system "applet" applied to COTS devices;
- a supporting concept like crowdsourcing philosophy but in a protected environment
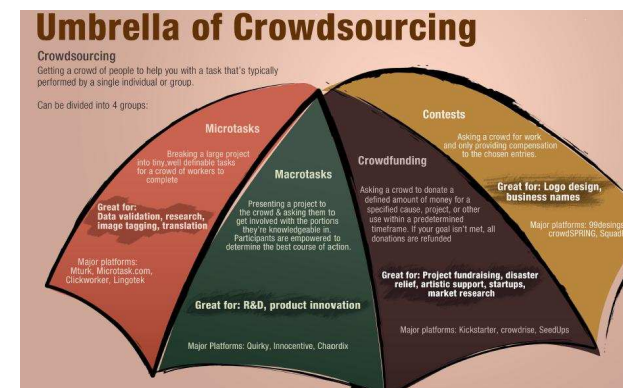
HOW TO INTEGRATE MOBILE COMMUNICATION TECHNOLOGIES AND BUSINESS NETWORKS IN TACTICS C2

we will define a type of COTS HW smart phone that meets certain requirements with regard to safety (i.e. crypto devices) and resistance to shock and weathering and a set of software to use.

INSS
(Information Negotiation Service Server)
IP number xxx.xxx.xxx.xxx

Coalition Military C2 environment

Military C2 environment

Government Agencies C2 environment

Other International Agencies C2 environments

Social/military information Exchange and data correlation

Sending/receiving SEFL
(Simple Exchange Formatted Language)

Portable COTS Devices
ACA - C24U
(Android Communication Applet)

Fusion Data base

Using a free application as "MIT APP Inventor"   Android Software Development Kit

Starting from a formatted text language (i.e. like *IRIS FORM & IRIS Web FORM TOOLs from Systematic)* will be possible develop a simplified formatted language based on specific information, tailored for lower level units and up to Battalion where all info and data will be parallel integrated in a classical C2 military system.


```
GDO  21051245Z  13//
FM  DOG1/SQUAD 3/PLT 2//
TO  HAWK CP 3/INF BN 34//
BT
UNCLAS/ENEMY/MOVE/PLT /ARM/ 5 VEH/DIR NW-SE/ 7 KMH/GRAVEL//
COORD/ ME  33TCD 94567324 Q  460/ ENEMY COORD 33TCD 913456956 Q  150 //
 ASK/WAITING  ORD//
BT
```

SEFL (Simple Exchange Formatted Language) Standardization of certain semantic elements, using few selected key elements and words from ADATP-3 protocol to receive information, evaluate, correlate and integrate them into a Data Base of fusion with other information.

The primary exchange its intended between tactical military and commercial networks to facilitate the flow of information and ensure a communication simple system. Mediation System INSS, could exchange data and other information between C2 others environments and hierarchical levels.

Fusion Networking System

Using 4G LTE Tactical Cellular transceiver that support simultaneous users, voice, SMS/MMS data and video capability.

Integration of different dedicated networks will expose to a security problems.
We can't solve this trouble but there are many different possibilities to mitigate and realize the best connections as possible.

· Keeping a low level of information classification
· Accreditation of individual devices
· Personalize access to the applet with password
· Possibility to deny access from servers to devices and viceversa
· Security Labels and Digital Signatures
· Scanning of attachments
· Reliable message transfer protocols
· End to end acknowledgements provide reliability and tracking (delivery & read receipts)
· Optimized protocols for constrained links
· Flexible precedence handling (priority)
· Personalization and interoperability of directories
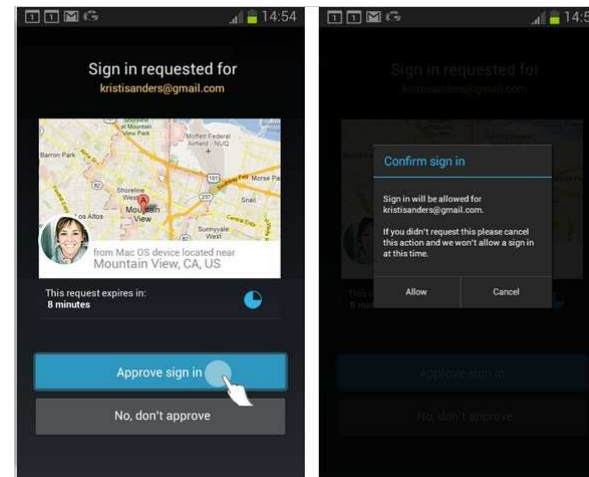
- The validation (CD&E) of this concept as interaction through military and business network will be possible through simulation;

- SimLabs asset from FINMECCANICA, as integrator of different realties (Armed Forces, Industry and Academia) is capable of providing the virtual System of Systems environment to test the different interaction among the different actors, networks, and devices;

- Simlabs has been already used in a operational scenario with the NATO M&S COE in Rome.

Technology is not a universal remedy but, can became an enabler for commander's decision process and help to decentralize C2

Technology would always enhance capabilities of forces on the ground and make simple apply special TTP, especially in the urban environments.

Using COTS available will reduce cost of development of new tools, implementing current technologies and make simple choose the best C2 method to implement on a specific operational situation, maintaining control and cohesion among more dispersed

To have success in a COIN environment will be also necessary innovate, learn and to adapt the equipment to the close operational environment.

Questions?